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**REMARKS**

Reconsideration of the application is respectfully requested for the following reasons:

1. Rejection Under 35 USC §102(f)

The Applicant respectfully notes that this rejection, based on the listing of the assignee as "applicant" on the PCT application has been withdrawn. It is, however, again respectfully noted that listing of a PCT applicant other than the inventor is not evidence of non-inventorship. The Examiner should ask herself, if the PCT "applicant" (usually, the assignee) had been listed as a company, would she have made the §102(f) rejection? Why, then, should she make the rejection if the "applicant" happens to be two individuals (the inventor assigned a share in the invention to an individual)?

2. Rejection of Claims 1-16 Under 35 USC §112, 1<sup>st</sup> Paragraph

So far as can be determined from the Examiner's hand-written comments on the Advisory Action, this rejection has been overcome.

3. Rejections of Claims 1-3, 6, and 12 Under 35 USC §102(b) in view of U.S. Patent No. 5,038,322 (Van Loenen), and of Claims 5, 9-11, and 14-16 Under 35 USC §103(a) in view of the Van Loenen patent

This rejection is again respectfully traversed on the grounds that the Van Loenen patent fails to disclose or suggest processing a material by a controlled succession of nanometer scale thermal spikes of varying energy in a cryogenic medium, as recited in claim 1. Cryogenically cooled apparatus containing a vacuum is not the same as apparatus containing a cryogenic medium into which thermal spikes are introduced, as claimed. To the contrary, a vacuum is by definition the absence of a "medium." Even if the vacuum is not perfect, it is unreasonable to assume that the vacuum could support the shockwaves or thermal spikes.

Nevertheless, to further clarify the nature of the invention, which has nothing to do with transfer of energy by electron emission in a vacuum, as in Van Loenen, the term

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cryogenic medium has been changed to "medium cooled to a cryogenic temperature," and the energy transfer by means of the thermal spikes or shockwaves has been further clarified. Even if the trace amounts of gas that might remain in the "vacuum" are interpreted as a "medium" (which applicant believes is patently unreasonable), such traces of gas could not possibly support transfer of energy to the medium by shockwaves or thermal spikes.

Since the Van Loenen patent does not suggest the claimed propagation of thermal spikes or shockwaves in a medium cooled to a cryogenic temperature, and certainly does not suggest propagation in such a medium for the purpose of efficiently transferring energy to a nano-scale area of the workpiece so as to facilitate the occurrence of chemical processes in the local area, withdrawal of the rejections of claims 1-6, 9, and 12 based on the Van Loenen patent is respectfully requested.

4. Rejection of Claim 13 Under 35 USC §103(a) in view of U.S. Patent Nos. 5,043,578 (Van Loenen) and 5,352, 330 (Wallace)

This rejection is again respectfully traversed on the grounds that the Wallace patent, like the Van Loenen patent, fails to disclose or suggest processing a material by generating a controlled succession of nanometer scale thermal spikes of varying energy, much less processing the material by thermal spikes of varying energy that propagate in a cryogenic medium, as recited in claim 1, from which claim 13 depends.

Instead, the Wallace patent discloses use of a low energy electron beam (as opposed to a conventional light beam) to remove surface passivation through an electron stimulated desorption effect. This effect requires that the electrons interact with atomic bonds between hydrogen and silicon to repel silicon atoms from the surface of the material. Thermal spikes or shockwaves are not utilized (assuming that "low energy" electrons would even generate such shockwaves), and no attempt is made to vary the energy of the thermal spikes or shockwaves. The process does not use a medium during the desorption, although oxygen is added later, and there is no suggestion of carrying out the process at cryogenic temperatures.

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It is respectfully submitted that since carrying out a process at cryogenic temperatures is more difficult than carrying out a process at room temperature, one of ordinary skill in the art would not have done so in the absence of a teaching that the specific process in question would benefit from being carried out in the presence of a cryogenic medium. Accordingly, it is respectfully submitted that the Van Loenen and Wallace patents could not have suggested the claimed invention, whether considered individually or in any reasonable combination, and withdrawal of the rejection of claim 13 under 35 USC §103(a) is respectfully requested.

5. Rejection of Claims 7, 9-11, and 14-16 Under 35 USC §103(a) in view of U.S. Patent Nos. 5,043,578 (Van Loenen), 3,720,598 (Thompson), and 4,343,993 (Binnig)

This rejection is again respectfully traversed on the grounds that while the Thompson patent teaches the use of cryogenic fluids as a medium through which an arc is discharged in a "cryogenic arc furnace," as discussed on pages 3-4 of the present application, there is no suggestion of using such a cryogenic medium in an electron beam etching system of the type disclosed by Van Loenen. The fact that cryogenic media are required in cryogenic blast furnaces is not a teaching that such media would be used in other, non-arc based media processing apparatus. To the contrary, in the absence of a teaching that the electron beam of Van Loenen could be used to propagate thermal spikes or shockwaves in the cryogenic medium (and there is absolutely no use for such spikes or shockwaves in the system of Van Loenen), it cannot be said that the ordinary artisan would have been motivated by Thompson to modify the system of Van Loenen to generate such shockwaves, much less in a controlled succession of thermal spikes or shockwaves of varying energy, as claimed.

The teachings of Binnig, on the other hand, are directly applicable to the system of Van Loenen. In particular, Binnig teaches vacuum operation and cryogenic cooling of a scanning tunneling microscope to improve to suppress thermal fluctuations and thereby improve the sensitivity of the microscope. However, this merely explains why Van Loenen mentions cryogenic cooling, and is not suggestive of a cryogenic shockwave-propagation medium, as claimed.

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The cryogenic cooling of a scanning tunneling microscope, as disclosed by Van Loenen and Binnig, has absolutely nothing to do with the cryogenic medium of the present invention. Van Loenen and Binnig are seeking to minimize disturbances in the scanning electron beam and circuitry by operating the apparatus as cryogenic temperatures in a vacuum, so that the electron beam does not have to pass through any medium. As a result, adding a medium of any kind would be contrary to the principles of operation of the Van Loenen and Binnig devices, while causing thermal spikes or shockwaves of varying energy would only make the situation worse, rendering it impossible to achieve the desired angstrom scale scanning resolution.

The Examiner is reminded a combination is improper if the teachings of the secondary reference appear to negatively affect the operation of the device disclosed in the primary reference. As explained in MPEP 2143.02 (page 2100-111):

*If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification* (citing *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)).

It is respectfully submitted that the addition of a medium to a system, such as that of Van Loenen or Binnig, that requires a vacuum is exactly the type of "unsatisfactory" modification referred-to in MPEP 2143.02.

In fact, even if just a *change* in principles of operation is required, the combination is non-obvious unless the teachings specifically address the changing in operating principle. For example, as explained in MPEP 2143.02:

*If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious* (citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)...*The court reversed the rejection holding the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate*" 123 USPQ at 352. (See also, MPEP 2141.02, p. 2100-107 "A prior art reference must be

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considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention (emphasis in the original).

It is respectfully submitted that the proposed modifications of the Van Loenen system would certainly change its principle of operation in ways that are not justified by the teachings of Binnig or Thompson.

Because Thompson discloses non-nano-scale cryogenic blast furnace as discussed on pages 2 and 3 of the present application, and Van Loenen considered in view of Binnig effectively teaches away from a cryogenic medium by requiring not only cryogenic cooling, but also a vacuum, it is respectfully submitted that rejection of claim 7 under 35 USC §103 is improper and should be withdrawn.

Having thus overcome each of the rejections made in the Official Action, withdrawal of the rejections and expedited passage of the application to issue is requested.

Respectfully submitted,

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